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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

REQUEST FOR FILING NATIONAL PHASE OF PCT APPLICATION UNDER 35 U.S.C. 371 AND 37 CFR 1.494 OR 1.495

To: Asst. Commissioner of Patents
Washington, D.C. 20231

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US)

Atty Dkt: PM 264179 M# | 2970371US Client Ref.

From: Pillsbury Madison & Sutro LLP, IP Group: Date: October 8, 1999

This is a **REQUEST** for **FILING** a PCT/USA National Phase Application based on:

1. International Application	2. International Filing Date	3. Earliest Priority Date Claimed
PCT/FI98/00322	09 April 1998	11 April 1997
⇧ country code	Day MONTH Year	Day MONTH Year (use item 2 if no earlier priority)

4. Measured from the earliest priority date in item 3, this PCT/USA National Phase Application Request is being filed within:

(a) ☐ 20 months from above item 3 date (b) ☒ 30 months from above item 3 date,

(c) Therefore, the due date (unextendable) is October 11, 1999

5. Title of Invention METHOD OF CONTROLLING LOAD IN MOBILE COMMUNICATION SYSTEM BY DTX PERIOD MODIFICATION

6. Inventor(s) TIKKA, Mauri

Applicant herewith submits the following under 35 U.S.C. 371 to effect filing:

7. ☒ Please immediately start national examination procedures (35 U.S.C. 371 (f)).

8. ☒ **A copy of the International Application** as filed (35 U.S.C. 371(c)(2)) is transmitted herewith (file if in English but, if in foreign language, file only if not transmitted to PTO by the International Bureau) including:

a. ☐ Request;
b. ☐ Abstract;
c. _____ pgs. Spec. and Claims;
d. _____ sheet(s) Drawing which are ☐ informal ☐ formal of size ☐ A4 ☐ 11"

9. ☒ **A copy of the International Application has been transmitted by the International Bureau.**

10. **A translation of the International Application** into English (35 U.S.C. 371(c)(2))
a. ☒ is transmitted herewith including: (1) ☒ Request; (2) ☒ Abstract;
(3) 12 pgs. Spec. and Claims;
(4) 5 sheet(s) Drawing which are:
☐ informal ☒ formal of size ☒ A4 ☐ 11"
b. ☐ is not required, as the application was filed in English.
c. ☐ is not herewith, but will be filed when required by the forthcoming PTO Missing Requirements Notice per Rule 494(c) if box 4(a) is X'd or Rule 495(c) if box 4(b) is X'd.
d. ☐ Translation statement attached (not required now).

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11. ☒ **PLEASE AMEND** the specification before its first line by inserting as a separate paragraph:
a. ☒ --This application is the national phase of international application PCT /FI98 /00322 filed April 9, 1998 which designated the U.S.--
b. ☐ --This application also claims the benefit of U.S. Provisional Application No. 60/ _____ , filed _____ .--

12. ☐ Amendments to the claims of the International Application **under PCT Article 19 (35 U.S.C. 371(c)(3)), i.e., before 18th month from first priority date above in item 3, are transmitted herewith (file only if in English) including:**

13. ☒ PCT Article 19 claim amendments (if any) have been transmitted by the International Bureau

14. ☐ Translation of the amendments to the claims **under PCT Article 19 (35 U.S.C. 371(c)(3)), i.e., of claim amendments** made before 18th month, **is attached (required by 20th month from the date in item 3 if box 4(a) above is X'd, or 30th month if box 4(b) is X'd, or else amendments will be considered canceled).**

15. **A declaration of the inventor** (35 U.S.C. 371(c)(4))
a. ☐ is submitted herewith ☐ Original ☐ Facsimile/Copy
b. ☒ is not herewith, but will be filed when required by the forthcoming PTO Missing Requirements Notice per Rule 494(c) if box 4(a) is X'd or Rule 495(c) if box 4(b) is X'd.

16. **An International Search Report (ISR):**
a. Was prepared by ☐ European Patent Office ☐ Japanese Patent Office ☒ Other
b. ☒ has been transmitted by the international Bureau to PTO.
c. ☒ copy herewith (2 pg(s).) ☒ plus Annex of family members (1 pg(s).).

17. **International Preliminary Examination Report** (IPER):
a. ☒ has been transmitted (if this letter is filed after 28 months from date in item 3) in English by the International Bureau with Annexes (if any) in original language.
b. ☒ copy herewith in English.
c.1 ☐ IPER Annex(es) in original language ("Annexes" are amendments made to claims/spec/drawings during Examination) including attached amended:
c.2 ☐ Specification/claim pages # _____ claims # _____
Dwg Sheets # _____
d. ☐ Translation of Annex(es) to IPER **(required by 30th month due date, or else annexed amendments will be considered canceled).**

18. **Information Disclosure Statement** including:
a. ☒ Attached Form PTO-1449 listing documents
b. ☒ Attached copies of documents listed on Form PTO-1449
c. ☒ A concise explanation of relevance of ISR references is given in the ISR.

19. ☐ **Assignment** document and Cover Sheet for recording are attached. Please mail the recorded assignment document back to the person whose signature, name and address appear at the end of this letter.

20. ☐ Copy of Power to IA agent.

21. ☐ **Drawings** (complete only if 8d or 10a(4) not completed): ___ sheet(s) per set: ☐ 1 set informal; ☐ 1 set formal of size ☐ A4 ☐ 11"

22. ☐ _____ (No.) **Verified Statement(s)** establishing "small entity" status under Rules 9 & 27

23. **Priority** is hereby claimed under 35 U.S.C. 119/365 based on the priority claim and the certified copy, both filed in the International Application during the international stage based on the filing in (country) Finland of:

	Application No.	Filing Date		Application No.	Filing Date
(1)	971538	April 11, 1997	(2)		
(3)			(4)		
(5)			(6)		

a. ☒ See Form PCT/IB/304 sent to US/DO with copy of priority documents. If copy has not been received, please proceed promptly to obtain same from the IB.
b. ☐ Copy of Form PCT/IB/304 attached.

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24. Attached: Finnish Office Action and the first page of WO 98/47291

25. **Preliminary Amendment:**

25.5 Per Item 17.c3, **cancel original** pages #_____, claims #_____, Drawing Sheets #

26. **Calculation of the U.S. National Fee (35 U.S.C. 371 (c)(1)) and other fees is as follows:**
based on amended claim(s) per above item(s) ☐ 12, ☐ 14, ☐ 17, ☐ 25, ☐ 25.5 (hilite)

				Fee Code (lg/sm entity) (see box 22)
Total Effective Claims	minus 20 = 0	x $18/$9	= $0	966/967
Independent Claims	minus 3 = 0	x $78/$39	= $0	964/965
If any proper (ignore improper) Multiple Dependent claim is present,		add$260/$130	+0	968/969

BASIC NATIONAL FEE (37 CFR 1.492(a)(1)-(4)): →→ **BASIC FEE REQUIRED, NOW** →→→→→→

A. If country code letters in item 1 are **not** "US","BR","BB","TT","MX","IL" "NZ", "IN" or "ZA"

See item 16 re:

1.	Search Report was not prepared by EPO or JPO - - - - - - - - -	add$970/$485		960/961
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SKIP B, C, D AND E UNLESS country code letters in item 1 are "US","BR","BB","TT","MX","IL", "NZ", "IN" or "ZA"

(X) → ☐	B. If USPTO did not issue both International Search Report (ISR) and (if box 4(b) above is X'd) the International Examination Report (IPER), - - - - - - - - - - - - - - - - - -	add$970/$485	+	960/961
(only) (one) → ☐ (of)	C. If USPTO issued ISR but not IPER (or box 4(a) above is X'd), -	add$760/$380	+	958/959
(these) (4) → ☐ (boxes)	D. If USPTO issued IPER but IPER Sec. V boxes not all 3 YES, -	add$670/$335	+	956/957
→ ☐	E. If international preliminary examination fee was paid to USPTO and Rules 492(a)(4) and 496(b) satisfied (IPER Sec. V all 3 boxes YES for all claims), - - - - - - - - - - - - -	add $96/$48	+	962/963
27.		**SUBTOTAL =**	$970	

28. If Assignment box 19 above is X'd, add Assignment Recording fee of ----$40 +0 581

29. Attached is a check to cover the - **TOTAL FEES** $970

Our Deposit Account No. 03-3975
Our Order No. 60258 (C#) | 264179 (M#)

CHARGE STATEMENT: The Commissioner is hereby authorized to charge any fee specifically authorized hereafter, or any missing or insufficient fee(s) filed, or asserted to be filed, or which should have been filed herewith or concerning any paper filed hereafter, and which may be required under Rules 16-18 and 492 (missing or insufficient fee only) now or hereafter relative to this application and the resulting Official document under Rule 20, or credit any overpayment, to our Account/Order Nos. shown above for which purpose a duplicate copy of this sheet is attached.
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METHOD OF CONTROLLING LOAD IN MOBILE COMMUNICATION SYSTEM

The present invention relates to a method of controlling load in a mobile communication system in a system in which the mobile stations comprise means for utilizing discontinuous transmission. The invention further relates to a mobile communication system comprising a mobile exchange, base stations in a data transmission connection to the mobile exchange, and mobile stations in a radio connection to the base stations, said mobile stations comprising means for utilizing discontinuous transmission. The invention further relates to a mobile station comprising transmission means and reception means for receiving and transmitting telecommunication signals via a radio path, a user interface for receiving voice signals, and control means for utilizing discontinuous transmission, the control means comprising signal processing means for processing the voice signals received through the interface by utilizing parameters stored in the mobile station for detecting speech from the voice signals received through the interface.

The present invention relates to controlling the load in a mobile communication system in which the mobile stations can utilize DTX (Discontinuous Transmission). The GSM system (Global System for Mobile Communications) is an example of this sort of system.

Discontinuous transmission aims to prolong the life of a battery in a mobile station by shortening the time a radio transmitter is in use. Furthermore, by reducing radio traffic, discontinuous transmission reduces disturbing interference on a radio path. In order to achieve these objects, in discontinuous transmission a mobile station transmits radio signals only when the user is speaking on it. In other words, the transmission to the radio path is interrupted during the breaks in speech. On the receiving side, pseudo noise, in other words comfort noise, is generated during the breaks in speech when no speech frames are received from a radio path. The parameters describing background noise are computed on the transmitting side and transmitted to the receiving side in the last frame, shortly before the transmission is interrupted. In addition to this, they are transmitted at regular intervals in the signaling channel.

In the GSM system, a mobile station encodes speech in 20 ms sequences in such a manner that a codec forms a set of parameters from each

20 ms voice sample. The size and structure of this parameter set is dependent on the codec used; there are several different codecs available. To transmit speech in the GSM system is thus to transmit encoded blocks.

To ensure the utilization of discontinuous transmission, a mobile station needs VAD (Voice Activity Detection) by means of which it can be examined whether a particular voice signal comprises speech or merely background noise. A GSM mobile station utilizing discontinuous transmission encodes speech at a rate of 13 kbit/s while the user is speaking, and at other times (in other words when the user is not speaking) at a rate of around 500 bit/s. The rate is sufficient for transmitting background noise to the other party of the call in order to make him/her notice that the call has not been disconnected.

There are various algorithms by means of which an encoded block comprising silence or background noise and a block comprising speech can be discriminated from each other. Usually the algorithm used is dependent on the encoding method used. The aim is to select the DTX parameters in such a manner that speech and background noise could be reliably discriminated from each other. By regulating these parameters DTX can be made to function in such a manner that even extremely quiet speech can start a transmission or, on the contrary, a DTX parameterization by which a transmission is not easily started can be provided.

The capacity of a mobile network is usually dimensioned in such a manner that the network is able to transmit the load peaks occurring normally. In other words, not every individual mobile station within the system has data transmission capacity continually reserved for it, but in conjunction with designing the network the aim has been to estimate the maximum capacity need, according to which the network has been dimensioned. In practice this means that mobile stations use existing data transmission capacity alternately, and if the number of simultaneously active (a call is in progress) mobile stations exceeds the number for which the capacity has been dimensioned, the mobile communication system fails to serve all mobile stations. Since it is extremely difficult to estimate the right capacity need in advance, in practice situations occur in which the capacity of a mobile communication system runs out.

A way to ensure that the capacity of a mobile communication system is sufficient is, of course, to increase the capacity of the network, in other words to dimension the network for a greater maximum capacity than before.

This, however, means increasing costs since in practice the result would be an over-dimensioning in which the network would have to be dimensioned for such a heavy traffic load which in practice would never exist on it.

An object of the present invention is to provide a solution for controlling load in a mobile communication system in such a manner that an existing traffic capacity can be utilized more efficiently than before to make it possible to serve a larger number of mobile stations than before, without a need to increase the capacity of a network, which would increase equipment costs. This object is achieved with the method of the invention, which is characterized in that at least one mobile station is equipped with regulation means for regulating its parameters related to discontinuous transmission, and a control signal is transmitted via a radio path to at least one said mobile station for regulating its parameters related to discontinuous transmission in such a manner that the mobile station transmits telecommunication signals to the other parts of the system more seldom or more often than before.

The invention is based on the idea that when a control signal can be transmitted from a mobile network via a radio path to the mobile stations of the system, said control signal enabling the mobile stations to regulate their parameters related to discontinuous transmission in such a manner that the mobile stations less often transmit radio signals to the other parts of the system, capacity can be released in the network in such a manner that the number of the mobile stations which can be simultaneously served by the network increases. In other words, when it is noted that the load of the mobile network is approaching the maximum capacity of the network, the capacity in use can be released by ordering the mobile stations to transmit more seldom than before, whereby a larger number of mobile stations can be served at particular capacity than before. In accordance with the invention, in some situations the mobile stations can be similarly controlled to regulate their parameters related to discontinuous transmission in such a manner that the mobile stations transmit radio signals to the other parts of the system more often than before.

The most essential advantages of the method of the invention are that it enables the existing capacity of a mobile network to be utilized more efficiently than before, that a larger number of mobile stations can be served at the existing capacity than before, whereby equipment costs associated with increasing the capacity are avoided, and that the method of the invention can

be applied to already existing mobile networks by extremely small changes, which can mainly be implemented by software modifications.

The invention further relates to a mobile communication system in which the method of the invention can be applied. The system of the invention is characterized in that the system comprises monitoring means for monitoring the traffic load in different parts of the system, control means responsive to the monitoring means for transmitting a predetermined control signal to certain mobile stations or mobile stations located in a certain area via a radio path when the monitoring means indicate that the traffic load in some part of the system exceeds the predetermined limit, and mobile stations comprising regulation means for regulating their parameters related to discontinuous transmission in response to the reception of the control signal in such a manner that said mobile stations more seldom or more often transmit datacommunication signals to the other parts of the system.

An essential advantage is achieved particularly in a mobile communication system in which the data transmission connection between a base station and a mobile exchange is packet switched, when monitoring means are arranged to monitor at least the amount of the free traffic capacity of the telecommunication connection between the base station and the mobile exchange and to transmit a control signal to mobile stations communicating with the base station when the free capacity drops beneath the limit value. In such a case, a reduction in the number of speech frames transmitted by the mobile stations via a radio path directly reduces the number of packets transmitted on the data transmission connection, in other words the amount of free capacity increases.

When the control means control the free traffic capacity of the radio channels of a certain base station or alternatively the quality of a call transmitted via one or several predetermined base stations, the control means detect when the load in a particular base station is becoming too heavy. In the CDMA (Code Division Multiple Access) system, for example, this can be seen in transmission power exceeding a certain limit. In such a case, an attempt can be made to release traffic capacity in the area of the CDMA system in question by commanding the mobile stations to transmit speech frames less often.

In a mobile communication system similar to the CDMA a radio interface does not precisely restrict the number of calls taking place in the area

of one base station, but the calls have a practical limit, and to exceed this limit leads to degraded voice quality of the calls. In this sort of "soft capacity" system, an attempt can be made to increase the capacity (by reducing interference) by the solution of the invention, which reduces interference in a base station environment.

The invention further relates to a mobile station which can be utilized in the system of the invention. The mobile station of the system is characterized in that the mobile station comprises detection means for detecting a predetermined control signal received by reception means via a radio path, and regulation means, responsive to the detection means, for changing said parameters utilized in speech detection by signal processing means in such a manner that the signal processing means interpret the voice signals received through a user interface as background noise more seldom than before or more often than before.

The preferred embodiments of the method and the mobile communication system of the invention are disclosed in the attached dependent claims 2 to 3 and 5 to 9.

The invention will be described in closer detail in the following by way of example with reference to the attached figures, in which

Figures 1A and 1B illustrate the load in a mobile communication system,

Figure 2 shows a flow diagram of a first preferred embodiment of the method of the invention,

Figure 3 shows a block diagram of a first preferred embodiment of the mobile communication system of the invention,

Figure 4 shows a block diagram of a preferred embodiment of the mobile station of the invention, and

Figure 5 illustrates the VAD function of the mobile station of Figure 4.

Figures 1A and 1B illustrate the load in a mobile communication system. Figures 1A and 1B can be assumed to describe the load in a data transmission connection between a single base station and a mobile exchange, for example, whereby the vertical axes describe load and the horizontal axes time t. In Figures 1A and 1B, the allowed maximum load MAX is indicated by the horizontal line, whereby the total data transmission capacity available is in use.

Figure 1A illustrates the load in a mobile network when the network is used by four mobile stations a to d. For the mobile stations, a horizontal line is drawn when a mobile station transmits speech blocks. The figure shows that at time instant t0 all four mobile stations transmit speech blocks simultaneously, whereby the load in the network exceeds its maximum limit, in other words the network fails to serve all mobile stations without interference.

Similarly, Figure 1B illustrates the load of the same mobile station as in the case of Figure 1A, but the method of the invention is applied to it, in other words, when the limit of the maximum load MAX of the network is approaching, the network transmits a predetermined control signal to the mobile stations to regulate the parameters related to their discontinuous transmission in such a manner that the mobile stations transmit speech frames less often than before. The load peak can thus be balanced, and no overload similar to that in Figure 1A occurs. For each mobile station, the change in the number of speech frames to be transmitted can be very small indeed, but the regulation is all-important to the entire network (or a part of the network).

Figure 2 shows a flow diagram of a first preferred embodiment of the method of the invention.

In block A of Figure 2 the load in different parts of the network is monitored. Between a base station and a mobile exchange in a packet switched transmission network, the number and/or size of the packets to be transmitted can be monitored, for instance. In the radio interface of a mobile network, the quality of connections in progress, for example, such as the bit error ratio, signal/noise ratio, or transmission powers (particularly in the CDMA systems) or corresponding parameters, which help to form a picture of the interference level in a base station environment, can be monitored.

In block B it is checked whether the load in some part of the mobile network is heavier than the reference value Kmax determined for it.

In block C a control signal making the mobile stations regulate their parameters related to discontinuous transmission in such a manner that said mobile stations transmit speech frames less often than before, is transmitted to those mobile stations which utilize the part of the network where the load exceeds the reference value Kmax. This can be achieved, for instance, by regulating those parameters which the mobile stations utilize for discriminating speech and background noise, whereby the mobile stations interpret the voice

signals received via their microphones as background noise more easily than before.

In block D it is checked whether the load in a mobile network (in the same part of the network in which the load in block B exceeded the reference value Kmax) drops below another reference value Kmin. If this is the case, it means that the load peak of the network is passed, which means a transfer to block E where a control signal making mobile stations regulate their parameters related to discontinuous transmission to their initial values, is transmitted to said mobile stations utilizing the part of the network in question.

As distinct from the block diagram in Figure 2, the parameters related to discontinuous transmission in mobile stations can also, of course, be steplessly regulated in such a manner that the regulation takes place steplessly in response to the traffic load of a network.

Figure 3 shows a block diagram of a first preferred embodiment of the mobile communication system of the invention. It can be assumed by way of example that the part of the mobile network shown in Figure 3 is a part of the CDMA mobile network.

The mobile exchange MSC shown in Figure 3 communicates with base station controllers BSC1 and BSC2 via packet switched connections, and in the case of Figure 3, the base station controller BSC1 communicates with base stations BTS1 and BTS2 via packet switched connections L1 and L3.

In Figure 3, the base station controller BSC1 is equipped with monitoring means 1 through which it monitors the load in the data transmission connections L1, L2 and L3. Furthermore, the base station controller monitors the transmission powers of the mobile stations in the radio cells of the base stations BTS1 and BTS2 (in the CDMA system, the transmission powers of a mobile station depend on the load in the radio cell in question). The monitoring means 1 thus note if some part of the network becomes too heavily loaded.

When the monitoring means 1 detect that the load of the data transmission connection L2, for example, is approaching its maximum allowed value, the monitoring means control the base stations BTS1 and BTS2 to transmit a predetermined control signal CNT to all mobile stations located in their radio coverage area. Said control signal is preferably transmitted as a cell broadcast in some broadcast control channel, in which also other data intended to all mobile stations, such as data on the calling channels of the radio

cell, is transmitted. The control signal can thus be transmitted to the largest possible number of mobile stations at the same time. Alternatively, the control signal can be transmitted to each mobile station one by one by utilizing an existing signaling channel.

In Figure 3, mobile stations MS1 to MS5 utilize discontinuous transmission in a manner known per se, in addition to which they are, in accordance with the invention, equipped with regulation means for regulating their parameters related to discontinuous transmission in response to the data contained in the control signal CNT. Subsequent to said regulation, the mobile stations MS1 to MS5 transmit speech blocks to the base stations BTS1 and BTS2 less often than before, whereby the base stations BTS1 and BTS2 correspondingly strain the packet switched connection L2 between the base station controller BSC1 and the mobile exchange MSC less than before.

Figure 4 shows a block diagram of the first preferred embodiment of the mobile station of the invention. The mobile station in Figure 4 can be a GSM system mobile station, for instance.

In Figure 4, the parts related to discontinuous transmission are shown in block TXDTX (Transmit DTX). From block TXDTX, speech frames, comprising a flag SP (Speech) in the control bits which indicates whether said frame comprises speech or whether a so called SID (Silence Descriptor) frame comprising data on background noise is in question, are continuously transmitted to the transmitting part. The SP flag is determined on the basis of a VAD flag provided from unit 2 indicating speech activity. When this flag has changed to zero, in other words when speech is no longer detected from the signal supplied from a user interface 3 (from a microphone), the SP flag is also changed to zero after the number of frames needed for computing background noise parameters, whereby a transmission unit TX still transmits the frame indicated by the zero flag and comprising the noise parameters to a base station via a radio path. Subsequently, the transmitter TX stops transmitting to the radio path, with the exception of the frame comprising noise data, transmitted at regular intervals. However, the TXTDTX block continues to transmit frames comprising noise data to the transmitter TX constantly.

When the VAD function redetects speech in the voice signal supplied from the user interface 3, the SP flag changes its value to one, whereby the transmitter resumes continuous transmission.

In accordance with the invention, a detector 4 is arranged in the mobile station in Figure 4 for detecting the control signal received by a receiver RX and a regulation unit 5 which in response to the control signal detected by the detector 4 regulates the parameters used in the VAD function in response to the data in the control signal. The parameters related to discontinuous transmission of the mobile station in Figure 4 can thus be regulated in such a manner that in conjunction with discontinuous transmission, the mobile station is made to interpret the voice signals received from its user interface as background noise more easily than before.

Figure 5 illustrates the VAD (Voice Activity Detection) function of the mobile station in Figure 4. The VAD function is mainly based on the detection of the energy of a signal received through a microphone. In order to eliminate background noise, however, the signal is filtered first, whereupon the energy of the filtered signal is compared with a threshold value, and if the threshold value is exceeded it is noted that the voice signal received through the microphone comprises speech.

The VAD function thus provides a plurality of alternatives for the invention to be applied in such a manner that a mobile station can be made to identify a received signal as background voice (and not as speech) more easily than before. The method of the invention can thus be applied by regulating the threshold value, for instance, or alternatively by changing the parameters of the filter, for instance.

The VAD function shown in Figure 5 is described in detail in the GSM Specification 06.32, which is incorporated herein by reference. The speech encoder of a mobile station computes the autocorrelation coefficients ACF required by the GSM Specifications 6.10, said coefficients being supplied to the VAD function by the speech encoder. Similarly, to the VAD function is supplied a long term predictor lag value N obtained from the speech encoder of the GSM specifications 6.10. A VAD flag, which affects the value of the SP flag described in conjunction with Figure 4, is obtained from the VAD function for initial data.

It will be understood that the above description and the accompanying figures are only intended to illustrate the present invention. It will be apparent to those skilled in the art that the invention can be modified and varied in many ways without departing from the scope and spirit of the invention disclosed in the attached claims.

CLAIMS

1. A method of controlling the load in a mobile communication system in a system in which the mobile stations comprise means for utilizing discontinuous transmission, **characterized** in that

at least one mobile station is equipped with regulation means for regulating its parameters related to discontinuous transmission, and

a control signal is transmitted via a radio path to said at least one mobile station for regulating its parameters related to discontinuous transmission in such a manner that the mobile station transmits telecommunication signals to the other parts of the system more seldom or more often than before.

2. A method as claimed in claim 1, **characterized** in that the control signal is selected in such a manner that said control means regulate at least those parameters related to discontinuous transmission on the basis of which the mobile station can discriminate between speech conveyed to a microphone and background noise in such a manner that the mobile station interprets the noise arriving at the microphone as background noise more easily than before.

3. A method as claimed in claims 1 or 2, **characterized** in that the traffic load in different parts of the mobile communication system is monitored, and said control signal is transmitted to certain mobile stations or mobile stations in a certain area, when the traffic load in some part of the system exceeds a predetermined limit, whereby said mobile stations that have received the control signal regulate their parameters related to discontinuos transmission in such a manner that they transmit telecommunication signals to the other parts of the system more seldom than before.

4. A mobile communication system comprising

a mobile exchange (MSC),

base stations (BTS1, BTS2) in data transmission connection to the mobile exchange, and

mobile stations (MS1 to MS5) in a radio connection to the base stations and comprising means for utilizing discontinuous transmission, **characterized** in that the system comprises

monitoring means (1) for monitoring the load in different parts of the system,

control means (BTS1, BTS2) responsive to the monitoring means

for transmitting, via a radio path, a control signal (CNT) to certain mobile stations (MS1 to MS5) or mobile stations in a certain area, when the monitoring means (1) indicate that the traffic load in some part (L2) of the system exceeds a predetermined limit, and

mobile stations (MS1 to MS5) comprising regulation means (5) for regulating their parameters related to discontinuous transmission in response to receiving the control signal in such a manner that said mobile stations transmit telecommunication signals to the other parts of the system more seldom or more often.

5. A mobile communication system as claimed in claim 4, **characterized** in that the monitoring means (1) are arranged to monitor the amount of the free traffic capacity of the data transmission connection (L1, L2) between at least one base station (BTS1) and mobile exchange (MSC) belonging to the system, whereby the control means (BTS1) are arranged to transmit said control signal (CNT) to all those mobile stations (MS1 to MS3) from which a traffic connection is in progress via said base station, when the control means indicate that the free traffic capacity is below the predetermined limit value.

6. A mobile communication system as claimed in claim 5, **characterized** in that said data transmission connection (L1, L2) between the base station (BTS1) and the mobile exchange (MSC) is a packet switched data transmission connection.

7. A mobile communication system as claimed in claim 4, **characterized** in that the monitoring means (1) are arranged to monitor the amount of the free traffic capacity of a certain base station (BTS1), whereby the control means (BTS1) are arranged to transmit said control signal (CNT) to all those mobile stations (BTS1 to BTS3) from which a traffic connection is in progress via said base station (BTS1), when the free traffic capacity is below the predetermined limit value.

8. A mobile communication system as claimed in claim 4, **characterized** in that the monitoring means (1) are arranged to monitor the quality of the traffic channels of a certain base station, whereby the control means are arranged to transmit said control signal (CNT) to all those mobile stations (MS1 to MS3) from which a traffic connection is in progress via said base station, when the quality of the traffic channels is below a predetermined limit.

9. A mobile station comprising

transmission means (TX) and reception means (RX) for receiving and transmitting telecommunication signals via a radio path,

a user interface (3) for receiving voice signals, and

control means (TXDTX) for utilizing discontinuous transmission, whereby the control means comprise signal processing means (2) for processing the voice signals received through the user interface by utilizing parameters stored in the mobile station in order to detect speech from the voice signals received through the interface (3), **characterized** in that the mobile station comprises:

detection means (4) for detecting a predetermined control signal (CNT) received by the reception means via the radio path, and

regulation means (5), responsive to the detection means (4), for changing said parameters utilized in speech detection in such a manner that the signal processing means interpret the voice signals received through the user interface (3) as background noise more seldom or more often than before.

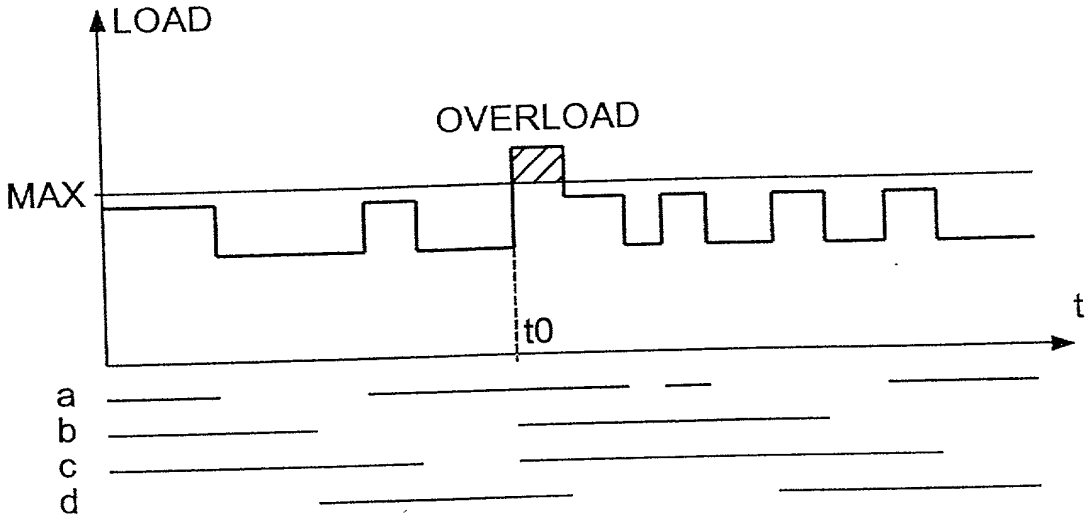

FIG. 1A

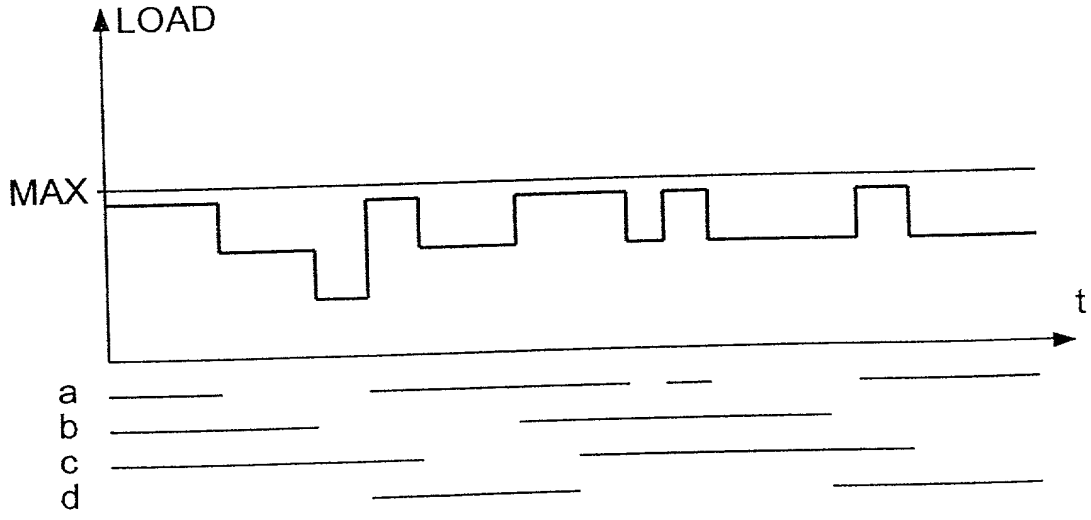

FIG. 1B

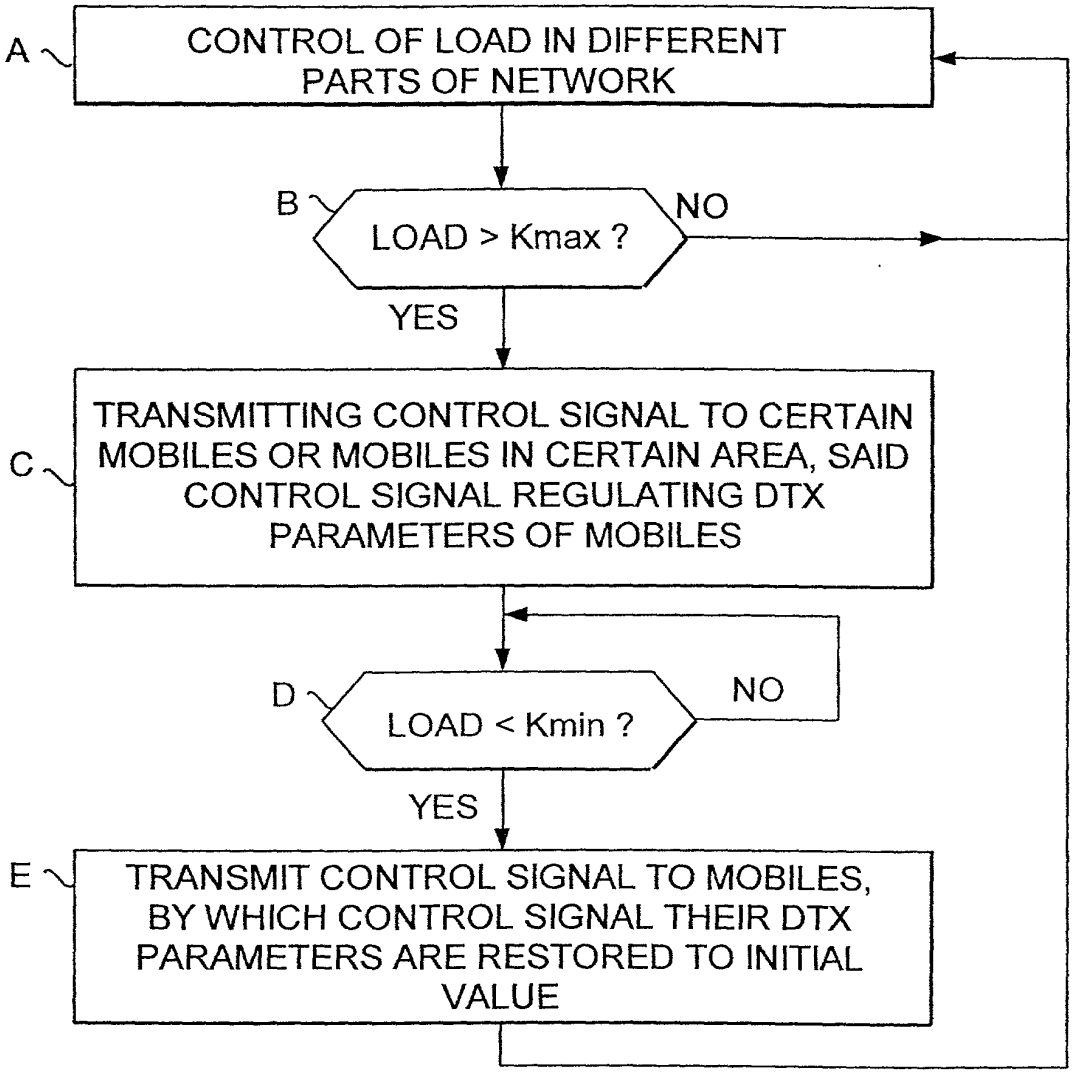
A
CONTROL OF LOAD IN DIFFERENT PARTS OF NETWORK
B
LOAD > Kmax ?
NO
YES
C
TRANSMITTING CONTROL SIGNAL TO CERTAIN MOBILES OR MOBILES IN CERTAIN AREA, SAID CONTROL SIGNAL REGULATING DTX PARAMETERS OF MOBILES
D
LOAD < Kmin ?
NO
YES
E
TRANSMIT CONTROL SIGNAL TO MOBILES, BY WHICH CONTROL SIGNAL THEIR DTX PARAMETERS ARE RESTORED TO INITIAL VALUE

FIG. 2

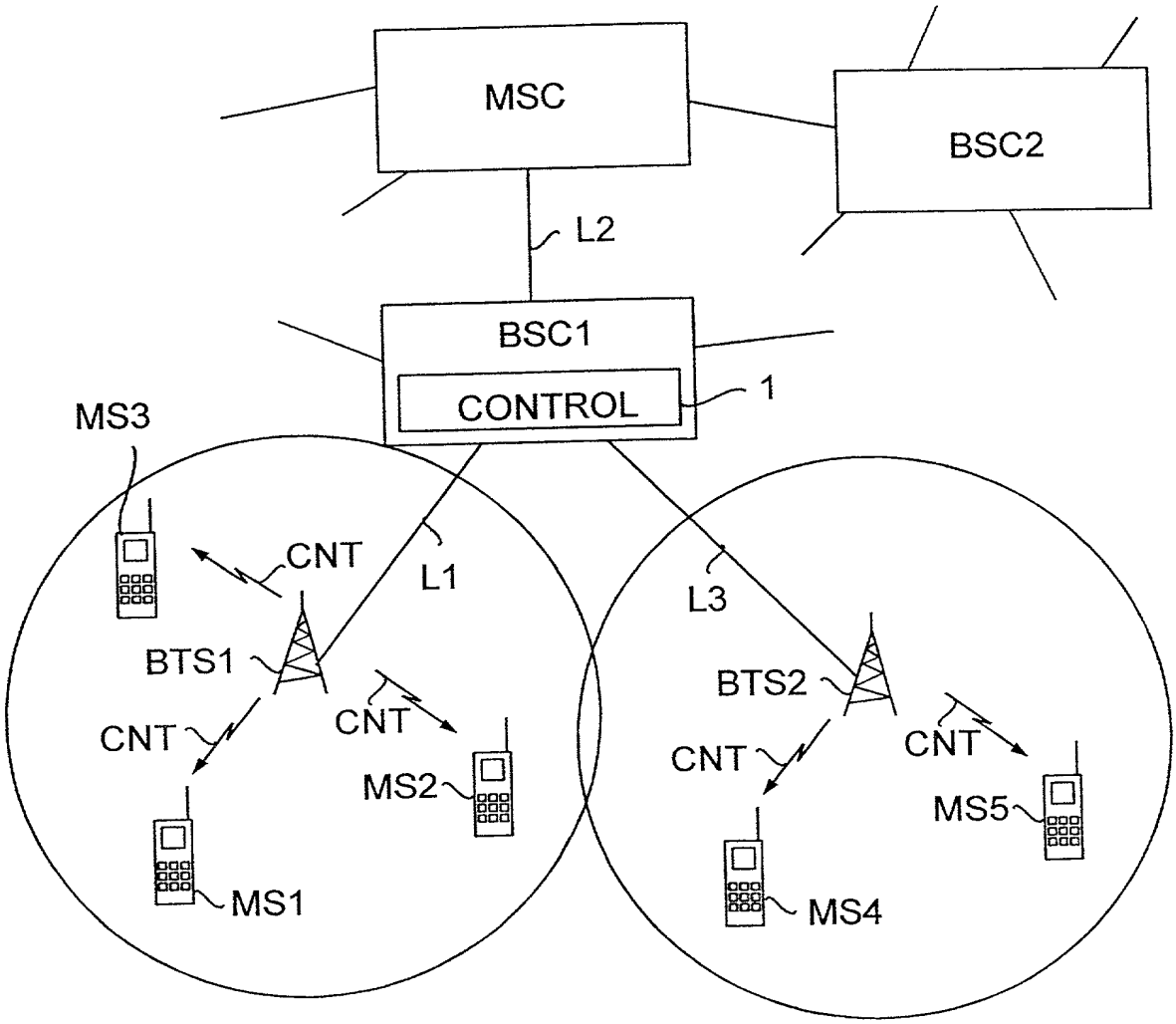
MSC
BSC2
L2
BSC1
CONTROL
1
MS3
CNT
L1
L3
BTS1
BTS2
CNT
CNT
CNT
CNT
MS2
MS5
MS1
MS4

FIG. 3

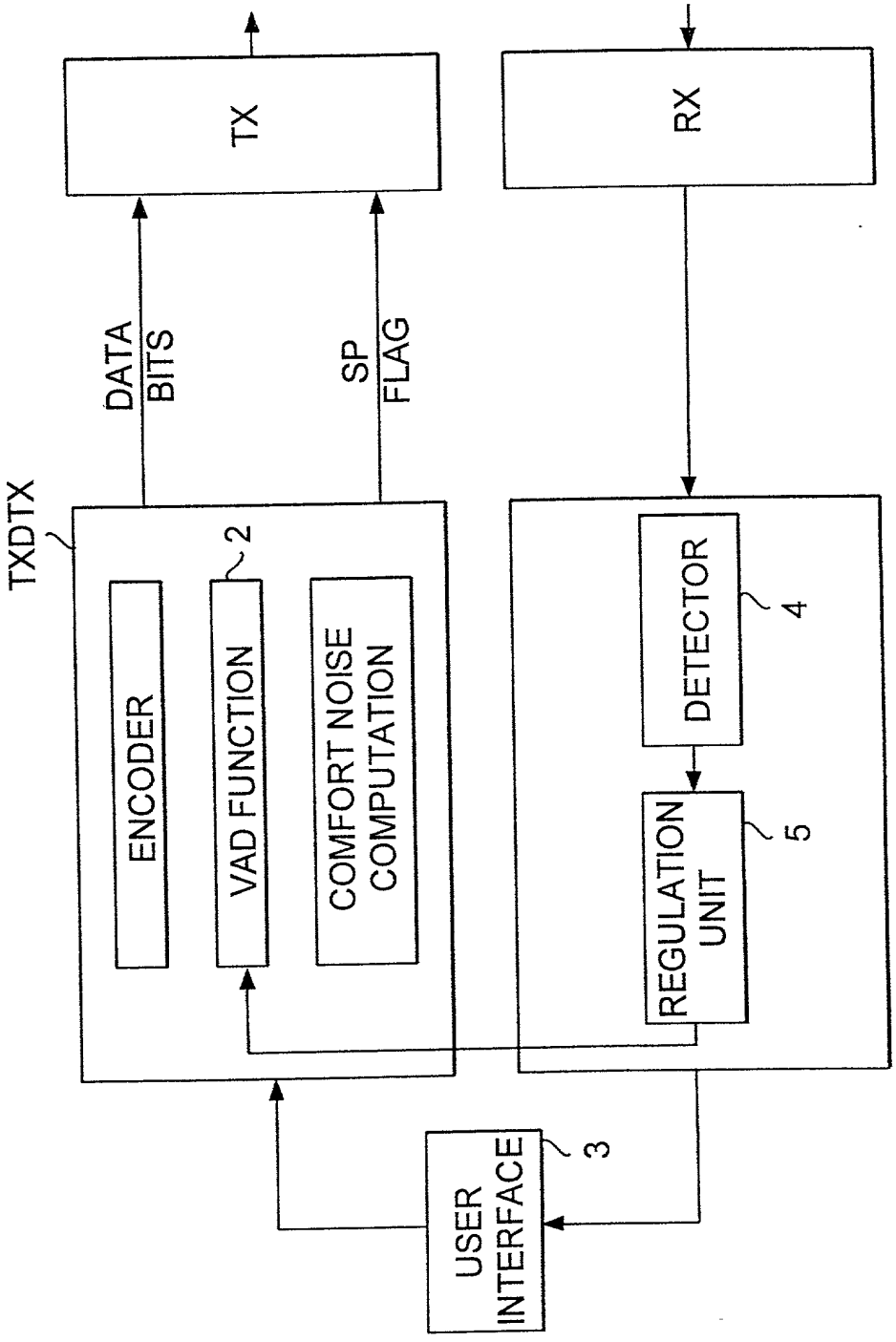
TX
RX
DATA BITS
SP FLAG
TXDTX
ENCODER
VAD FUNCTION
2
COMFORT NOISE COMPUTATION
DETECTOR
4
REGULATION UNIT
5
USER INTERFACE
3

FIG. 4

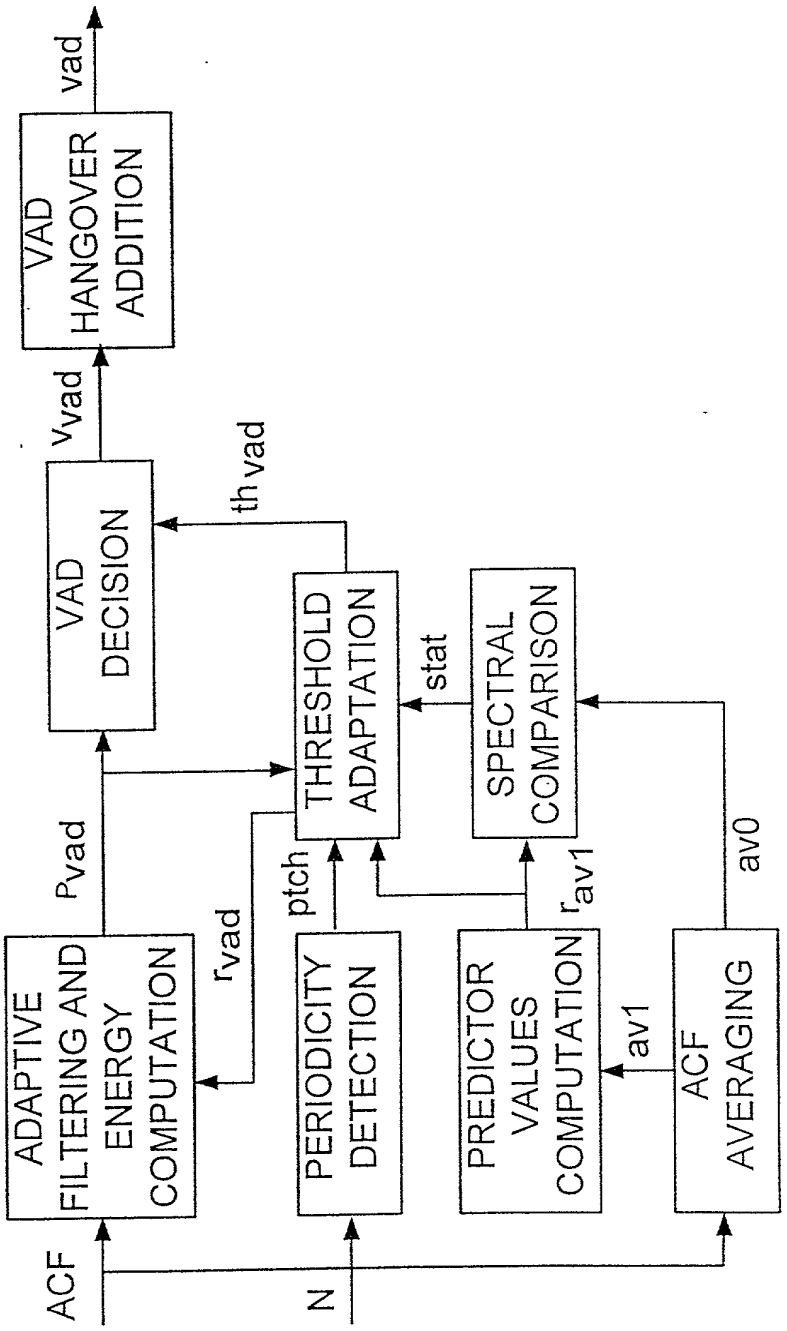
ACF
N
ADAPTIVE FILTERING AND ENERGY COMPUTATION
PERIODICITY DETECTION
PREDICTOR VALUES COMPUTATION
ACF AVERAGING
THRESHOLD ADAPTATION
SPECTRAL COMPARISON
VAD DECISION
VAD HANGOVER ADDITION
Pvad
rvad
ptch
rav1
av1
av0
stat
th vad
vvad
vad

FIG. 5

FOR UTILITY/DESIGN
CIP/PCT NATIONAL/PLANT
ORIGINAL/SUBSTITUTE/SUPPLEMENTAL
DECLARATIONS

RULE 63 (37 C.F.R. 1.63) DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

PM & S
FORM

As a below named inventor, I hereby declare that my residence, post office address and citizenship are as stated below next to my name, and I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the INVENTION ENTITLED

Method of controlling load in mobile communication system by DTX period modification

the specification of which (CHECK applicable BOX(ES))

X BOX(ES)
→ A. ☐ is attached hereto.
→ B. ☐ was filed on _____ as U.S. Application No. _____ /
→ C. ☒ was filed as PCT International Application No. PCT/ FI98 / 00322 on 9 April 1998

and (if applicable to U.S. or PCT application) was amended on _____

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above. I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 C.F.R. 1.56. I hereby claim foreign priority benefits under 35 U.S.C. 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT International Application which designated at least one other country than the United States, listed below and have also identified below any foreign application for patent or inventor's certificate, or PCT International Application, filed by me or my assignee disclosing the subject matter claimed in this application and having a filing date (1) before that of the application on which priority is claimed, or (2) if no priority claimed, before the filing date of this application:

PRIOR FOREIGN APPLICATION(S) Number	Country	Day/MONTH/Year Filed	Date first Laid-open or Published	Date Patented or Granted	Priority Claimed Yes	No
971538	Finland	11 April 1997			X	

I hereby claim domestic priority benefit under 35 U.S.C. 119(e) or 120 and 365(c) of the indicated United States applications listed below and PCT international applications listed above or below and, if this is a continuation-in-part (CIP) application, insofar as the subject matter disclosed and claimed in this application is in addition to that disclosed in such prior applications, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in 37 C.F.R. 1.56 which became available between the filing date of each such prior application and the national or PCT international filing date of this application

PRIOR U.S. PROVISIONAL, NONPROVISIONAL AND/OR PCT APPLICATION(S) Application No. (series code/serial no.)	Day/MONTH/Year Filed	Status pending, abandoned, patented	Priority Claimed Yes	No

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

And I hereby appoint Pillsbury Madison & Sutro LLP, Intellectual Property Group, 1100 New York Avenue, N.W., Ninth Floor, East Tower, Washington, D.C. 20005-3918, telephone number (202) 861-3000 (to whom all communications are to be directed), and the below-named persons (of the same address) individually and collectively my attorneys to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith and with the resulting patent, and I hereby authorize them to delete names/numbers below of persons no longer with their firm and to act and rely on instructions from and communicate directly with the person/assignee/attorney/firm/ organization who/which first sends/sent this case to them and by whom/which I hereby declare that I have consented after full disclosure to be represented unless/until I instruct the above Firm and/or a below attorney in writing to the contrary.

Paul N. Kokulis	16773	Dale S. Lazar	28872	Mark G. Paulson	30793	Michael R. Dzwonczyk	36787
Raymond F. Lippitt	17519	Paul E. White, Jr.	32011	Stephen C. Glazier	31361	W. Patrick Bengtsson	32456
G. Lloyd Knight	17698	Glenn J. Perry	28458	Paul F. McQuade	31542	Jack S. Barufka	37087
Carl G. Love	18781	Kendrew H. Colton	30368	Ruth N. Morduch	31044	Adam R. Hess	41835
Kevin E. Joyce	20508	G. Paul Edgell	24238	Richard H. Zaitlen	27248		
George M. Sirilla	18221	Lynn E. Eccleston	35861	Roger R. Wise	31204		
Donald J. Bird	25323	Timothy J. Klima	34852	Jay M. Finkelstein	21082		
Peter W. Gowdey	25872	David A. Jakopin	32995	Anita M. Kirkpatrick	32617		

(1) INVENTOR'S SIGNATURE: _____ Date: 8th October 1999

First	Middle Initial	Family Name
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Residence	City	State/Foreign Country	Country of Citizenship
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(2) INVENTOR'S SIGNATURE: _____ Date:

First	Middle Initial	Family Name

Residence	City	State/Foreign Country	Country of Citizenship

Post Office Address (include Zip Code)	

(FOR ADDITIONAL INVENTORS, check box ☐ to attach PAT 116-2 same information for each re signature, name, date, citizenship, residence and address.)

Rule 56(a) & (b) = 37 C.F.R. 1.56(a) & (b)
PATENT AND TRADEMARK CASES - RULES OF PRACTICE
DUTY OF DISCLOSURE

(a) ...Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the [Patent and Trademark] Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability...(b) information is material to patentability when it is not cumulative and (1) It also establishes by itself, or in combination with other information, a prima facie case of unpatentability of a claim or (2) refutes, or is inconsistent with, a position the applicant takes in: (i) Opposing an argument of unpatentability relied on by the Office, or (ii) Asserting an argument of patentability

PATENT LAWS 35 U.S.C.

§102. Conditions for patentability; novelty and loss of right to patent

A person shall be entitled to a patent unless--

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for patent or

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of the application for patent in the United States, or

(c) he has abandoned the invention, or

(d) the invention was first patented or caused to be patented, or was the subject of an inventor's certificate, by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country on an application for patent or inventor's certificate filed more than twelve months* before the filing of the application in the United States, or

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent, or

(f) he did not himself invent the subject matter sought to be patented, or

(g) before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it. In determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other.

§103. Condition for patentability; non-obvious subject matter

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made. . . .

(c) Subject matter developed by another person, which qualified as prior art only under subsection (f) or (g) of section 102 of this title, shall not preclude patentability under this section where the subject matter and the claimed invention were, at the time the invention was made, owned by the same person or subject to an obligation of assignment to the same person.

* Six months for Design Applications (35 U.S.C. 172).